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NATIONAL DAM SAFETY PROGRAM. LAKE TIORATI DAM (NY-00043), HUDSO--ETC(U)
SEP 78 J J WILLIAMS DACW51-78-C-0035

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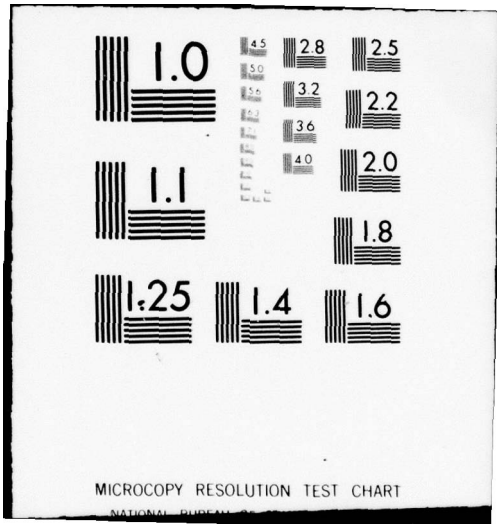
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MICROCOPY RESOLUTION TEST CHART

HUDSON RIVER VALLEY

STAHAHE BROOK, ORANGE COUNTY

NEW YORK

LAKE TIORATI DAM

PHASE I INSPECTION REPORT

NATIONAL DAM SAFETY PROGRAM

NY 00043

APPROVED FOR PUBLIC RELEASE;
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CONTRACT NO. DACW 51-78-C-0035

DEPARTMENT OF THE ARMY
NEW YORK DISTRICT, CORPS OF ENGINEERS
26 FEDERAL PLAZA
NEW YORK, NEW YORK 10007

AUGUST 1978

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

REPORT DOCUMENTATION PAGE

READ INSTRUCTIONS BEFORE COMPLETING FORM

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4. TITLE (and Subtitle)
Phase I Inspection Report
Lake Tiorati Dam
Hudson River Basin, Orange County, New York
Inventory No. N.Y. 43

5. TYPE OF REPORT & PERIOD COVERED
Phase I Inspection Report
National Dam Safety Program

6. PERFORMING ORG. REPORT NUMBER

7. AUTHOR(s)
John J. Williams, P.E.

8. CONTRACT OR GRANT NUMBER(s)
DACW-51-78-C-0035

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O'Brien and Gere Engineers, Inc.
1301 Buckley Road
Syracuse, New York 13221

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Dam Safety
National Dam Safety Program
Visual Inspection
Hydrology, Structural Stability
Lake Tiorati Dam
Stahahe Brood
Orange County

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)
This report provides information and analysis on the physical condition of the dam as of the report date. Information and analysis are based on visual inspection of the dam by the performing organization.
Lake Tiorati dam has no detrimental findings to render an unsafe assessment. Recommendations to repair concrete structure, and study effect of closing draw down pipe were made.

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HUDSON RIVER BASIN

Name of Dam: Lake Tiorati Dam
County and State: Orange County, State of New York
Inventory Number: NY 43

PHASE I INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM

Prepared by: O'Brien and Gere Engineers, Inc.

For: New York State
Department of Environmental Conservation

Date: July 26, 1978

PHASE I REPORT

NATIONAL DAM INSPECTION PROGRAM

Name of Dam: Lake Tiorati Dam

State Located: New York
County Located: Orange County
Stream: Stahahe Brook
Date of Inspection: June 26, 1978

ASSESSMENT OF
GENERAL CONDITIONS

Lake Tiorati Dam is a concrete gravity structure. An earth embankment has been built against the downstream face to support a roadway across the stream valley.

No detrimental findings were made during the visual inspection of the dam to render an unsafe assessment. However, small amounts of seepage were observed at the downstream toe of the earth embankment, and spalling and deterioration of the upstream face of the concrete structure are evident.

Remedial work should be performed on the upstream face of the concrete structure in order to reduce leakage and prevent further damage due to frost action.

The placement of the earth embankment on the downstream face has buried a pipe that could have been used to empty the reservoir. A further investigation should be made for the provision of emergency drawdown facilities.

The reservoir can store the rainfall associated with the Spillway Design Flood ($\frac{1}{2}$PMF) with no outflow.

O'BRIEN & GERE ENGINEERS, INC.

John J. Williams

John J. Williams, P.E.
Vice President

Approved by: Clark H. Benn
Clark H. Benn
Colonel, Corps of Engineers
District Engineer

Date: 21 September 1978

OVERALL VIEW OF DAM

TABLE OF CONTENTS

PHASE I INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM
NAME OF DAM LAKE TIORATI DAM ID# NY 43

SECTION 1 - PROJECT INFORMATION

1.1 GENERAL

a. Authority - This report is authorized by the Dam Inspection Act, Public Law 92-367, and has been prepared in accordance with contract #1467.021 between O'Brien and Gere Engineers, Inc., and the New York State Department of Environmental Conservation.

b. Purpose of Inspection - The purpose of this inspection is to evaluate the structural and hydraulic conditions of Lake Tiorati Dam and appurtenant structures, and to determine if the dam constitutes a hazard to human property.

1.2 PROJECT DESCRIPTION

a. General - Lake Tiorati and Lake Tiorati Dam are located in the southeastern part of the Catskill Mountains, about 16 miles northwest of Stony Point, New York, on Stahahe Brook. The dam was built in 1915 by the Palilsades Interstate Park Commission to create a lake for recreational use in the Palisades Interstate Park.

b. Description of Dam and Appurtenances (From drawings furnished by the New York State Department of Environmental Conservation) The dam is a non-reinforced concrete dam of gravity type cross-section, with a vertical upstream face and a sloping downstream face. In 1924, a portion of the upstream face was repaired by the addition of a 12 inch thick layer of concrete, which was anchored to the original concrete face. The field inspection revealed that an earth embankment has been built against the downstream face to carry a roadway across the stream valley.

The dam has a maximum height of about 21 feet with a crest length of about 518 feet. The earth fill for the roadway has a top width of about 45 feet at an elevation approximately at the crest of the dam, and a downstream slope of about 1.5 horizontal to 1 vertical. Refer to Figure 4 for details of the original concrete dam. Figure 5 shows the details of the added concrete protection on the upstream face.

The original dam had a 36" x 36" sluice gate, with a corresponding outlet duct through the concrete, to permit draining the lake. However, the field inspection revealed that the outlet from this drainage duct has been covered by the roadway fill, and consequently the lake cannot be drained by opening the sluice gate.

The only other outlet works are two spillways located near the left abutment; the crest of each spillway weir is 3 feet below the top of the dam. Figure 4 shows only one spillway, but two were found in the field inspection, about 30 feet apart. (Figure 5 also shows two) Each spillway has a crest 10 feet in length and about 4½ feet wide. Water flowing over each of the spillways drops sharply for several feet and flows into a pipe about 4 feet in diameter. These pipes in turn lead into pipes about 5 feet in diameter at the downstream face of the roadway fill. The 5 foot diameter pipes are only about 3 feet long. Refer to the photographs in the appendix for a view into the spillway inlet and the two downstream outlets from the spillways.

c. Size Classification - Lake Tiorati has a normal storage capacity of 5,100 acre-feet at the spillway crest elevation of 1030.0 Mean Sea Level (MSL) (based on data from USGS 7.5 Minute Quadrangle Sheet, Popolopen Lake). The maximum height of the dam is 21 feet. This places the dam in the intermediate size category as defined by the Recommended Guidelines for Safety Inspection of Dams.

d. Hazard Classification - Lake Tiorati Dam creates an impoundment of 5,100 acre-feet. Failure of the dam would release a flood wave that would move down a partially wooded valley for about 6 miles to the town of Stony Point, with a population of about 8,300 people. Attenuation of the flood wave in transit should greatly reduce the hazard to human life at Stoney Point. Between the dam and the town, the flood wave would pass under the Palisades Interstate Parkway. Damage to the Parkway bridges would depend to a great extent on the amount of debris carried by the flood wave. Some damage to homes, highways, utilities and businesses would be expected. Therefore, the Lake Tiorati Dam is in the significant hazard category as defined in the Recommended Guidelines for Safety Inspection of Dams.

1.3 PERTINENT DATA

a. Drainage Area - The drainage area of Lake Tiorati Dam is about 1.3 square miles (determined from United States Geological Survey 7.5 minute Quadrangle Sheet, Popolopen Lake, N.Y.).

b. Discharge at Damsite - The calculated spillway capacity at maximum pool elevation is 234 cubic feet per second (cfs). Discharge records are not available.

c. Reservoir Data - (obtained from USGS 7.5 Minute Quadrangle Sheet).

Normal Pool (reservoir at spillway crest)

Elevation - 1,030 feet
Length - 7,000 feet
Area - 285 acres
Volume - 5,100 acre-feet

Top of Dam (reservoir at crest elevation)

Elevation - 1,033 feet
Length - 7,000 feet
Area - 290 acres
Volume - 6,000 acre-feet

Maximum Pool ($\frac{1}{2}$ PMF - no outflow)

Elevation - 1032.8 feet
Length - 7,000 feet
Area - 290 acres
Volume - 5,950 acre-feet

d. Dam Data (from drawings supplied by NYSDEC)

Top of Dam - Elevation 1,033 feet
Length - 518 feet
Height - 21 feet maximum

e. Outlet Data - According to the drawings furnished, the outlet facility is located at the base of the deepest section of the dam. The facility consists of a 36 inch square concrete conduit with a sluice gate at the inlet to regulate flow.

f. Spillway Data (from drawings supplied by NYSDEC)

Type - concrete overflow weirs, two existing
Length of each weir - 10 feet
Crest Elevation - 1,030 feet
Downstream Channel - each spillway is connected to a 48 inch concrete culvert, with a free fall outlet.

g. Engineering Data - The information available for review included:

1) A drawing showing plan, elevation, section and details of the dam.

2) A drawing showing elevation and details for resurfacing of the upstream face.

3) A geological map of New York.

4) USGS Quadrangle Sheet, 7.5 Minute Series, Popolopen Lake, New York.

5) Correspondence concerning the dam, including an inspection report dated, July 3, 1974.

1.4 OPERATING AND MAINTENANCE PROCEDURES

a. Operation - There is no normal method to withdraw water from the lake. The only outflow from the lake is spillway overflow.

b. Maintenance of Dam and Operating Facilities - Maintenance at the site appears to be minimal as evidenced by the accumulation of debris in the spillway outlet chambers and spalling and frost damage on the upstream face of the concrete gravity structure. According to the senior park engineer, Mr. Robert Santoro, the sluice gate, originally provided to drain the lake, is not operational.

c. Flood Warning System - No information regarding any type of flood warning system was made available.

SECTION 2 - VISUAL INSPECTION

2.1 FINDINGS

a. General - The field inspection of Lake Tiorati Dam took place on June 26, 1978. The lake water surface elevation was about 1,030 feet Mean Sea Level during the inspection visit. No underwater areas were inspected. No water was discharging over the spillways at the time of the inspection.

b. Dam - The left (looking downstream) abutment of the dam appears to be founded on a hard ledge type rock. The upstream face of the concrete shows considerable spalling and frost damage to an elevation about 3 feet below the water level. Spalling is also severe at some of the vertical construction joints. An earth fill has been placed against the downstream face of the concrete. This fill is used to support a macadam surfaced roadway across the stream valley. The fill has a top elevation at the dam crest, a top width of about 45 feet and a downstream slope of about 1 vertical to 1.5 horizontal. There are some undulations in the roadway surface and evidences of paving fill to correct for settlement. The top width of the fill also varies due to curvature of the road. The downstream face of the fill is covered with underbrush and some trees. There are some stumps where trees have been cut off about 9 inches above the ground. Seepage is evident at several locations along the downstream toe of the fill. At a few of the areas, seepage is clear; at other areas, a brown discoloration and oily appearance are evident. Downstream of the fill there is an old road, simply a dirt track, and two pipes about 18 inches in diameter to carry surface flow under this road. The stream channel is not well-defined immediately downstream of the dam; most of the area is covered with underbrush and tree growth.

c. Spillways - Two concrete weir type spillways are built into the upstream face of the dam. Both are about 10 feet in length, with a crest width of about 4½ feet. The overflow from each spillway drops several feet into a concrete transition chamber and then flows into a 48" diameter concrete pipe. The spillway transition chambers contain considerable debris which partially cloggs the pipe inlets. The 48" diameter pipe has been extended through the roadway fill; near its outlet end, a transition is made to a 60 inch diameter pipe for a length of about 3 feet. The two outlet pipes discharge flow into a low area filled with large boulders which serve as energy dissipators.

d. Outlet Works - There are no operational outlet works for the dam. The original sluice gate does not appear to be operable, and the downstream end of its outlet conduit is buried under the roadway fill.

e. Lake Area - Tiorati Lake is surrounded by low lying well rounded hills with moderate slopes, thus confining the drainage basin to a relatively small surrounding area. The hill slopes are well covered with trees and undergrowth. The entire area is used for recreational purposes.

f. Downstream Channel - Immediately downstream of the dam the stream channel passes through a narrow well wooded valley. Further downstream, the valley widens out considerably; the stream channel remains relatively small and is not capable of carrying high flood flows within its banks. Where the stream passes Stony Point, the valley is quite wide and flat.

SECTION 3 - HYDROLOGY AND HYDRAULICS

The Spillway Design Flood (SDF) for Lake Tiorati Dam is one half of the Probable Maximum Flood (½PMF). The surface of Lake Tiorati comprises about 36 per cent of the drainage basin upstream of the dam. The reservoir can store the rainfall associated with the SDF with no outflow. Therefore, the spillway is adequate for outflows associated with storms in excess of the SDF.

No operable means of drawdown is available at the Lake Tiorati Dam. The placement of the earth embankment on the downstream face has buried the outlet through the concrete structure. A sluice gate is shown on the plans, and the stem was observed during the field inspection. It is reported that the mechanism is not operable.

SECTION 4 - STRUCTURAL STABILITY

4.1 VISUAL OBSERVATIONS AND DATA REVIEWS

No design calculations were made available for review. The composition and characteristics of the material used in the earth embankment built against the downstream face of the concrete gravity dam are not known. The quality and class of concrete used are also unknown.

A stability analysis was made for the concrete gravity structure at its maximum cross-section, using dimensions as given in the existing plans. Factual data pertaining to foundation conditions are not available. Therefore, design assumptions concerning foundation rock characteristics are based on information obtained from field observations made during the course of the inspection.

Examination of the stability analysis reveals the spillway structure to be stable with the reservoir water surface at the top of the embankment. Under this condition, minor tension (-2.52 psi) is developed at the heel of dam. The earth embankment downstream of the gravity dam has a significant stabilizing effect on the dam and should not be removed.

4.2 GEOLOGY AND SEISMIC STABILITY

Lake Tiorati Dam is located across Stahehe Brook in hilly topography within the New England Uplands physiographic province. The rocks in this province consist of both metamorphic and igneous types in varied and complex structure. The dam and reservoir rest on both the unconsolidated alluvial deposits in the stream valley and gneissic type bedrock, as described in the Geologic Map of New York (Lower Hudson Sheet) and as observed in the field.

The immediate area does not contain any notable faults or lineaments; however, the existence of the Ramapo Fault extends some distance to the northwest and southeast of the reservoir area and recent minor seismic activity along the fault should be noted. It is considered that this seismic activity should pose no problems to the stability of the dam as located within Seismic Risk Zone 1 of the Seismic Zone Map of Antiguous States. It appears that static stability calculations are satisfactory for design.

SECTION 5 - ASSESSMENT/REMEDIAL MEASURES

5.1 ASSESSMENT

The stability of the concrete dam appears to be adequate. The roadway fill significantly improves the stability of the dam, and should not be removed without otherwise strengthening the dam.

Seepage at the downstream toe of the earth embankment indicates the possibility of some small leakage through the vertical construction joints. This leakage might create future problems concerning the embankment fill, but should not affect the stability of the concrete dam unless the flow increases.

Since the outlet works are inoperable there is no capability to drawdown the lake.

5.2 REMEDIAL MEASURES

1) The spalled upstream face of the concrete should be repaired by guniting or a similar repair process.

2) A flexible adhesive sealing compound should be applied to the upstream portion of the vertical construction joints to reduce ice damage and seepage.

3) The spillway transition chambers should be cleaned of all debris.

4) Trash racks should be installed at the spillways to prevent further accumulation of debris.

5) The outlet area from the spillways should be provided with a clear and well defined channel to permit unobstructed flow.

6) The sluice gate should be restored to its original working condition and its outlet conduit extended through the roadway fill. This will permit draining the reservoir when needed.

FIGURES

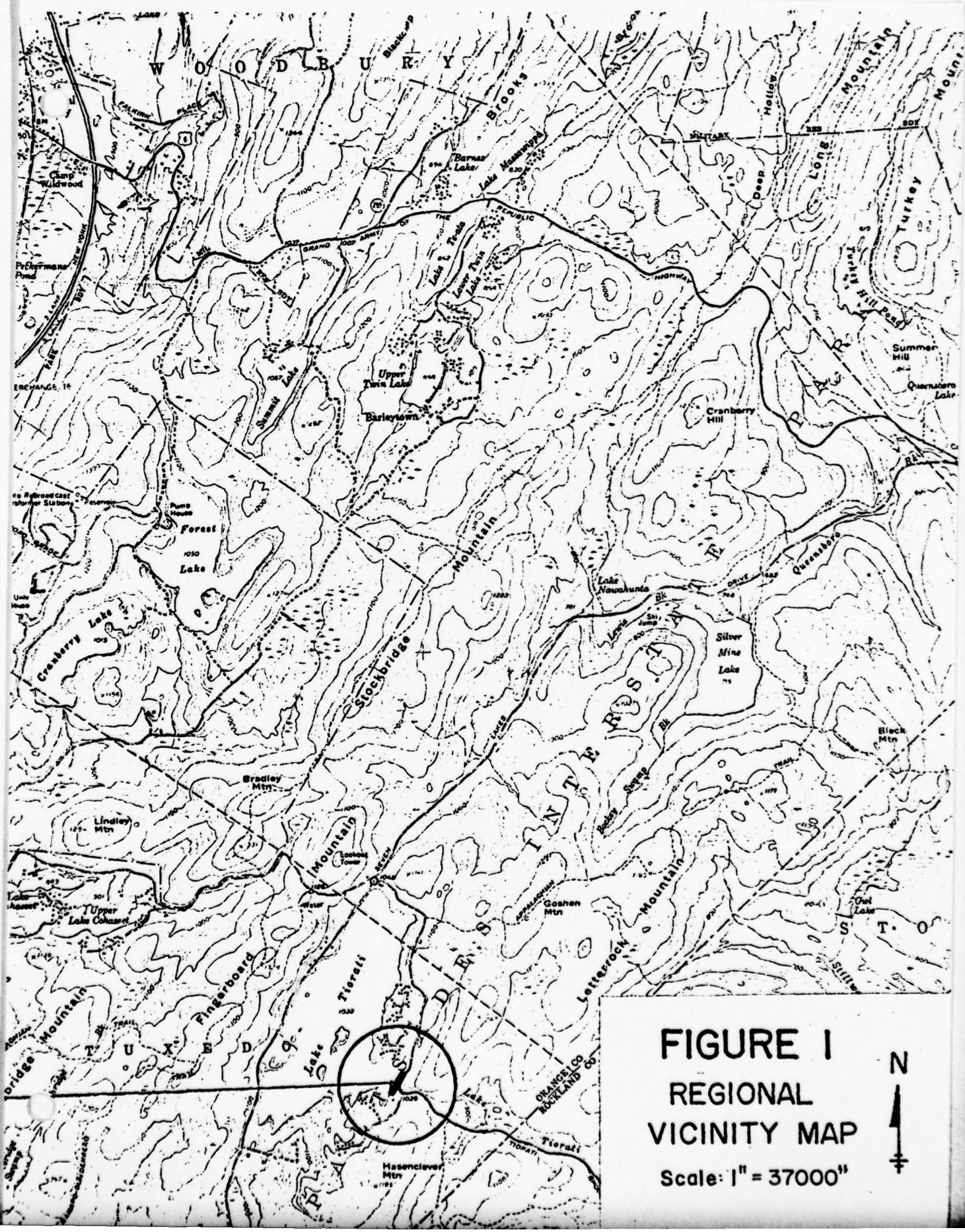

FIGURE 1

REGIONAL VICINITY MAP

Scale: 1" = 37000'

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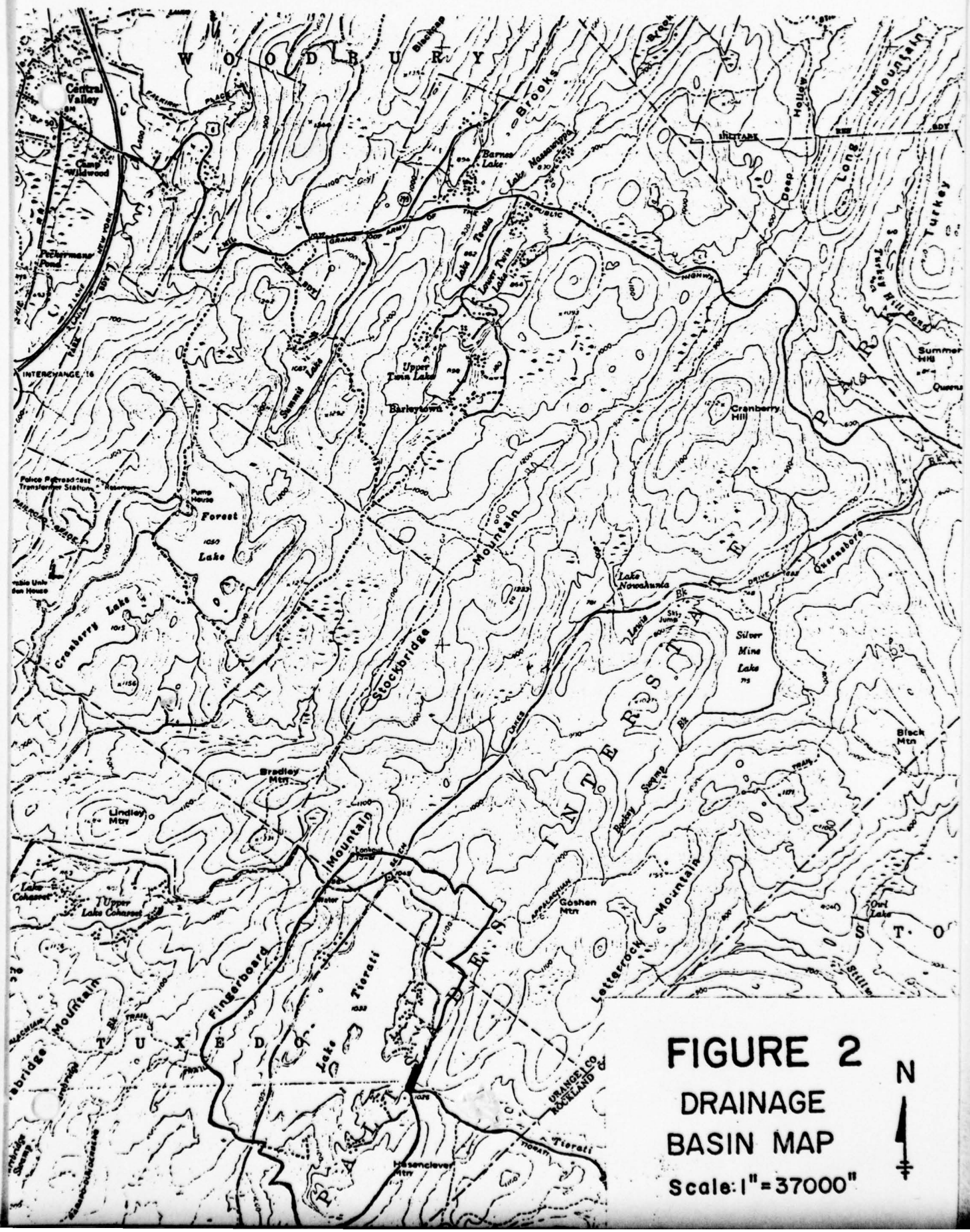

FIGURE 2

DRAINAGE BASIN MAP

Scale: 1" = 37000"

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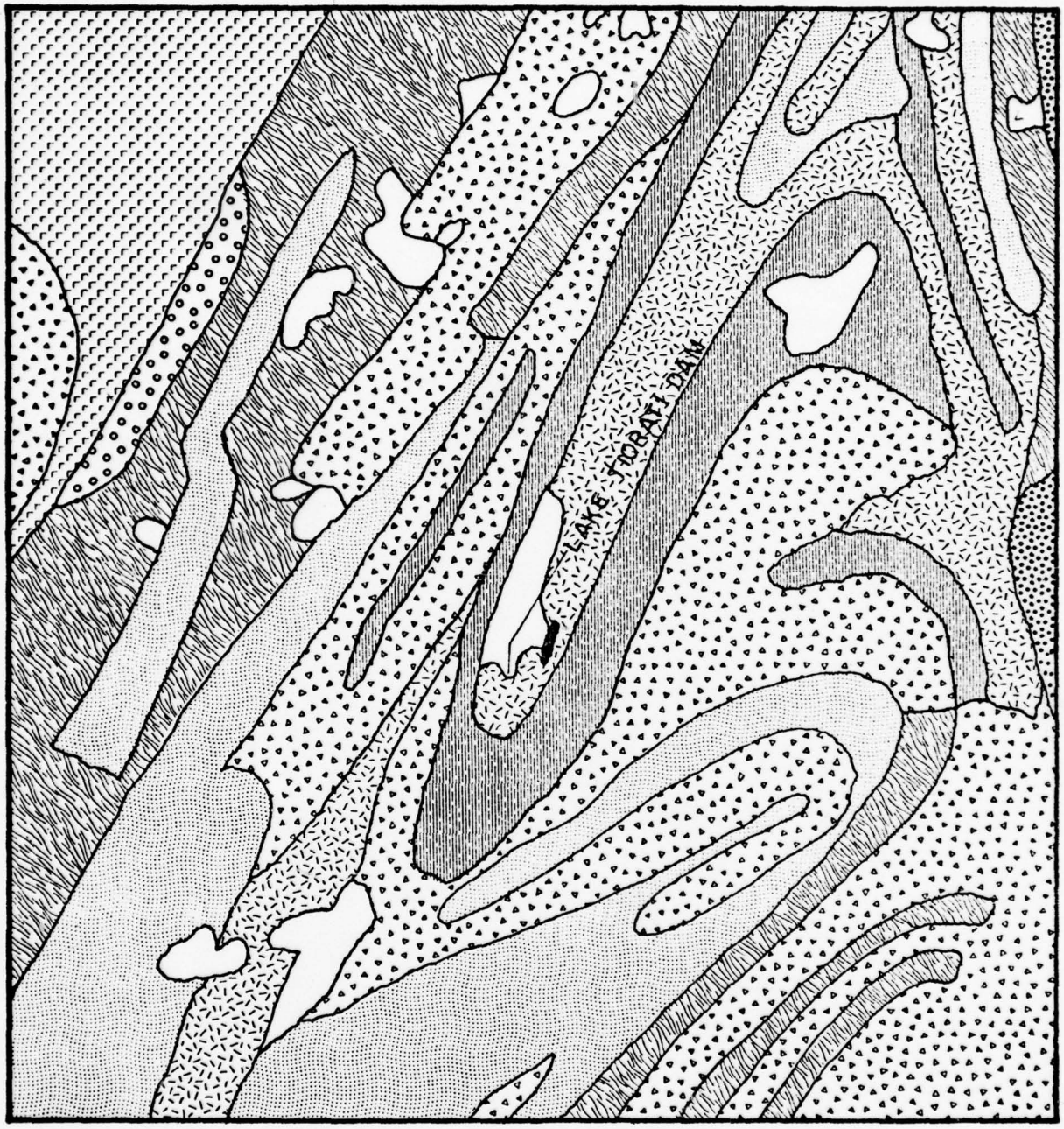
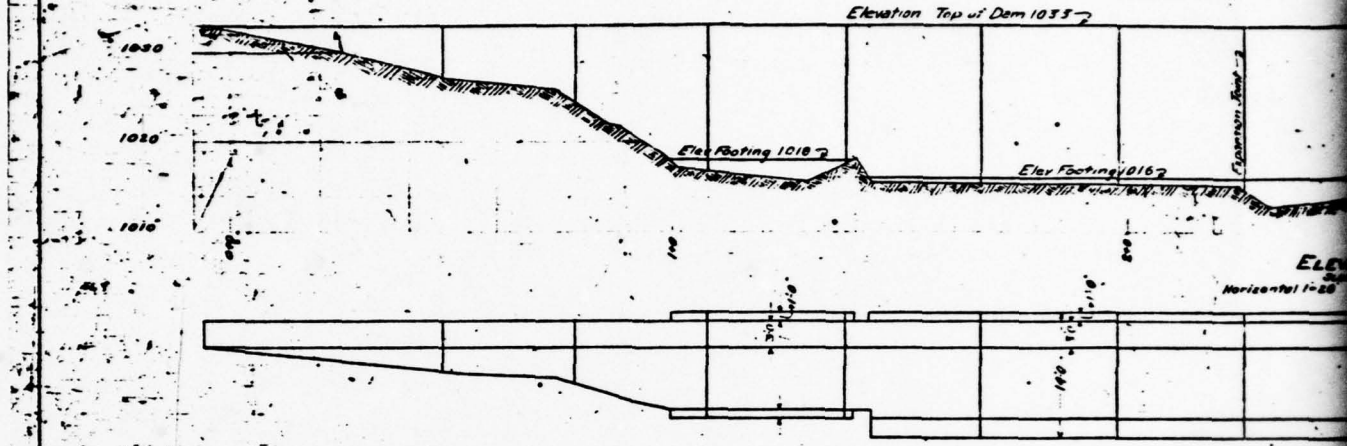
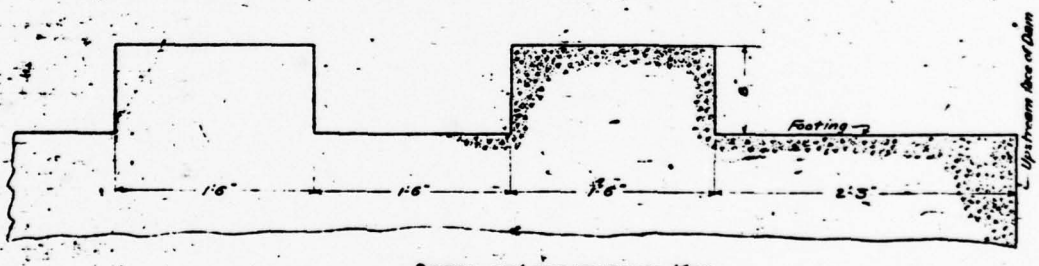


SCALE: 1" = 1 Mile

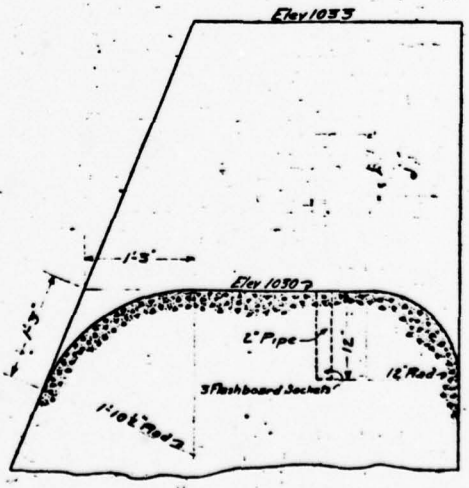
- GRANITIC GNEISS
- HORNBLENDE GRANITE & GRANITIC GNEISS
- BIOTITE - QUARTZ - PLAGIOCLASE - GNEISS
- QUARTZ - PLAGIOCLASE - GNEISS
- WAPPINGER GROUP - LIMESTONE DOLOSTONE
- AMPHIBOLITE - HORNBLENDE - GNEISS
- BIOTITE - QUARTZ - FELDSPAR - GNEISS
- BIOTITE - GRANITIC GNEISS

FIGURE 3
GEOLOGIC MAP





DETAIL OF LONGITUDINAL KEY
Scale 1"-1'-0"



SECTION AT SPILLWAY
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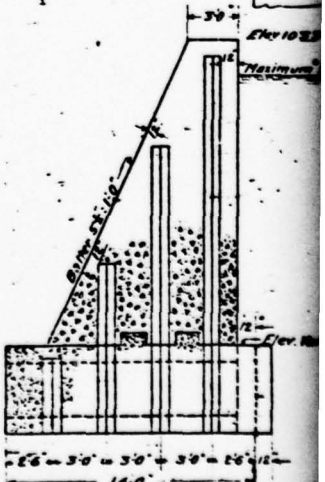

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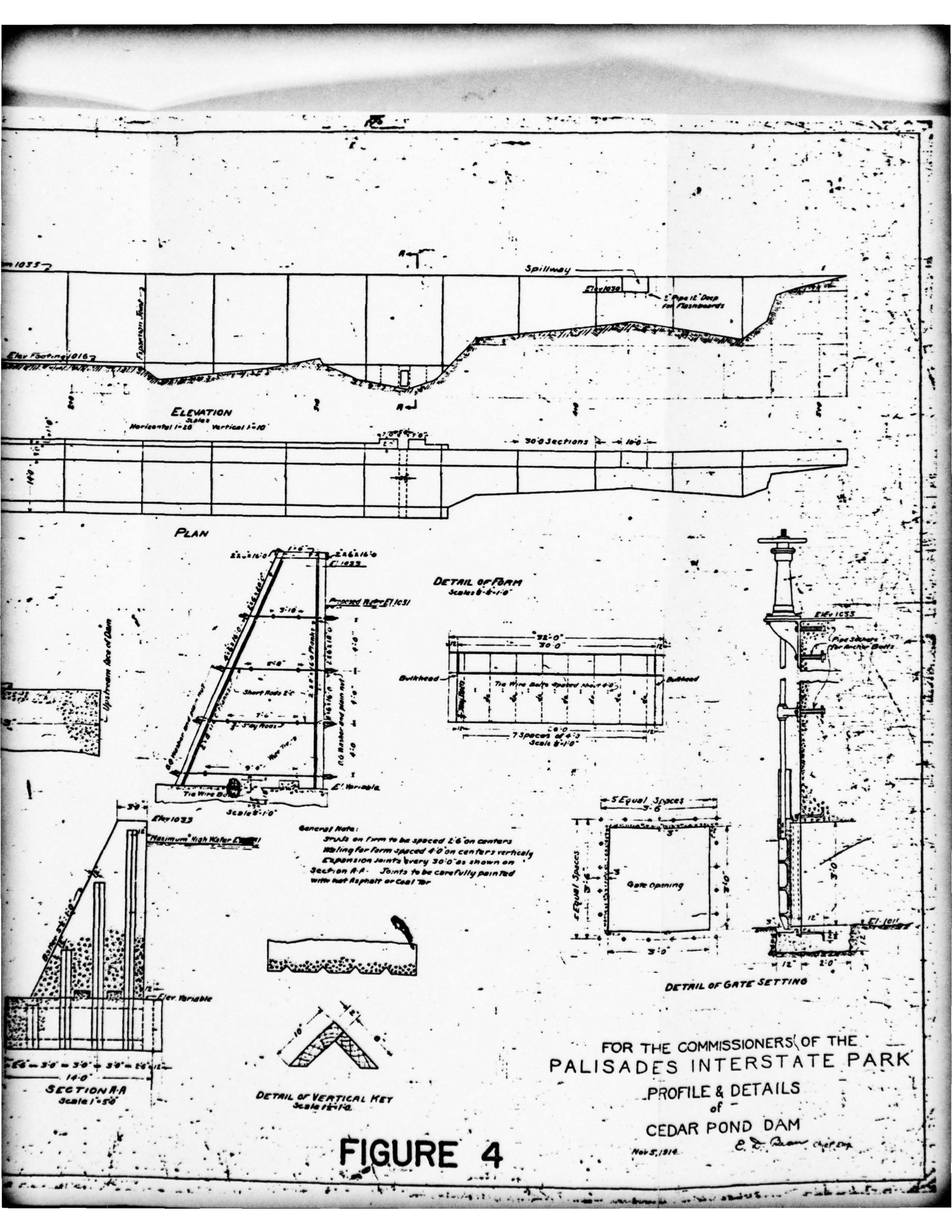
CHECKED BY E.M. Hussey
DATE Nov 5, 1914



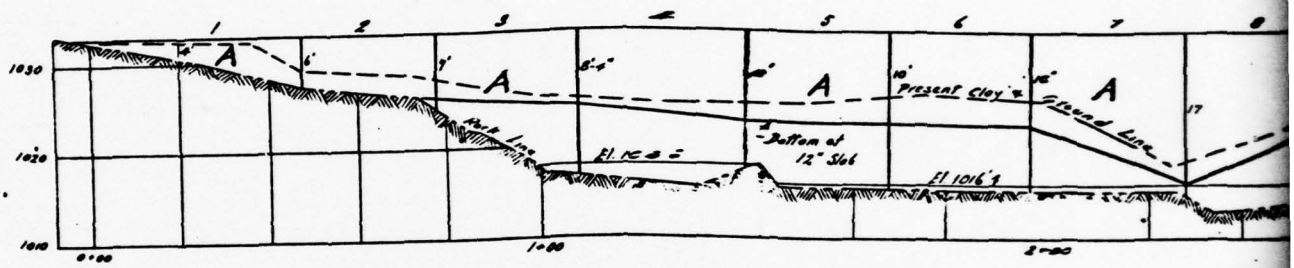
FOR THE COMMISSIONERS OF THE
PALISADES INTERSTATE PARK
PROFILE & DETAILS
of
CEDAR POND DAM

Nov 5, 1914

E. D. Bean Chief Eng.

FIGURE 4

5, Fol. 2



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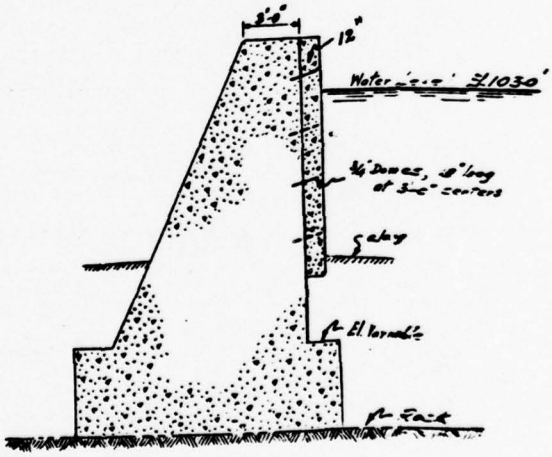
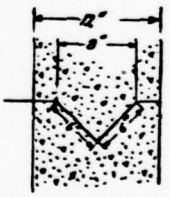
SCALES: H=

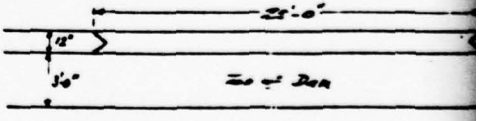


TYPICAL SECTION
SCALE: 1"=5'

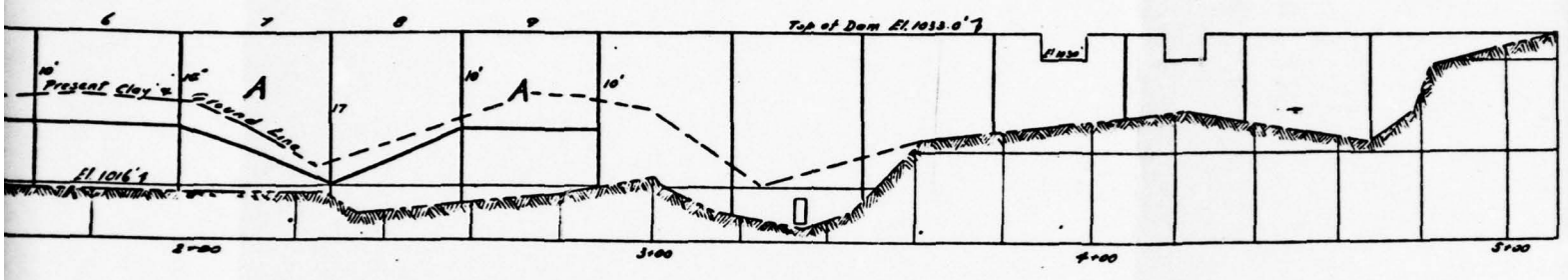


DETAIL OF VERTICAL KEY

DETA

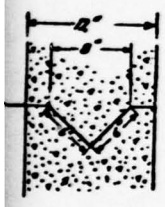


PLAN



ELEVATION

SCALES: 1"=20' HOR. 1"=10' VERT.



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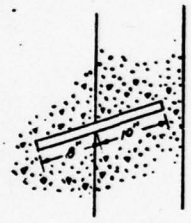
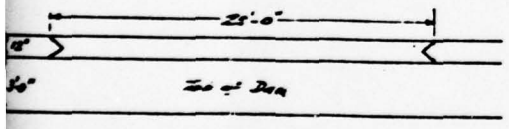


DETAIL OF DOWEL



PLAN

NOTE: SECTIONS MARKED "A" ARE WHERE CONCRETE WAS AFFECTED BY FROST ACTION IN ORIGINAL DAM

FOR THE COMMISSIONERS OF THE PALISADES INTERSTATE PARK

WATERPROOFING

CEDAR POND DAM

(LAKE TIORATI)

AUG. 15, 1924

W. A. WELCH, CHIEF ENG.

FIGURE 5

2

APPENDIX

PHOTOGRAPHS

DEBRIS IN UPSTREAM CONDUIT OPENING

OPERATING MECHANISM OF SLUICE GATE

CRACKED AND SPALLED CONSTRUCTION
JOINT ON UPSTREAM FACE

OUTLET CONDUITS

FIELD INSPECTION REPORT

Check List
Visual Inspection
Phase 1

Name Dam Lake Tiorati **County** Orange **State** New York **Coordinators** _____

Date(s) Inspection 6/26/78 **Weather** Overcast **Temperature** 70°

Pool Elevation at Time of Inspection 1030 **M.S.L.** **Tailwater at Time of Inspection** _____ **M.S.L.**

Inspection Personnel:

George C. Elias — James V. Ryan

Frank Falcone

Charles Richardson

James V. Ryan **Recorder**

Accompanied by:

Bob Santoro: Senior Park Engineer

CONCRETE/MASONRY DAMS

VISUAL EXAMINATION OF	OBERSVATIONS	REMARKS OR RECOMMENDATIONS
SURFACE CRACKS CONCRETE SURFACES	The concrete surfaces are in fair condition. A minor amount of spalling has occurred along the upstream face, with most of the spalling occurring at the water line.	Observe and note further spalling
STRUCTURAL CRACKING	No problems noted.	None.
VERTICAL AND HORIZONTAL ALIGNMENT	A few of the construction joints have begun to displace horizontally. A movement of about 1 inch was observed of one of the concrete sections.	Observe and note further movement.
MONOLITH JOINTS	No problems noted.	None.
CONSTRUCTION JOINTS	The construction joints are in poor condition. Spalling and cracking was observed in joints in the middle of the upstream face. Also these joints had undergone horizontal movement. The joints have no bituminous material to seal them.	Observe joints and note further movement.

CONCRETE/MASONRY DAMS

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SEE PAGE ON LEAKAGE	The dam is covered by a 32 foot wide road fill. A 5 GPM flow was observed seeping at various points in the fill. Since the dam is covered with this fill no visual observations were made.	Observe downstream channel for increasing flow.
STRUCTURE TO ABUTMENT/EMBANKMENT JUNCTIONS	No problems noted.	None.
DRAINS	A 3 foot square conduit is present in the dams center section. However, the drain is not operational.	Repair sluice gate at inlet. Install a culvert from outlet to downstream channel.
WATER PASSAGES	None noted.	None.
FOUNDATION	Outcroppings of granite and granite gneisses were observed in the area near the dam.	None.

UNGATED SPILLWAY

VISUAL EXAMINATION OF	OBSERVATIONS	REMARK OR RECOMMENDATIONS
Approach Channel	No problems noted	None
Concrete Weir	Trash racks on the spillways were removed. This allows debris to get trapped in the opening of the 2 - 48" conduit connected to the spillway.	Place trash racks in front of the spillways. Remove and check for trapped debris in the opening of the 2 - 48" conduit.
Discharge Channel	A considerable amount of debris is at the outlet of each conduit. This debris extends from each conduit outlet to the downstream channel, a distance of about 50 feet.	Remove the debris from the outlet of both conduits to the downstream channel.
Bridge and Pier	None noted.	None.

OUTLET WORKS

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CRACKING AND SPALLING OF CONCRETE SURFACES IN OUTLET CONDUIT	The outlet conduit is a 36 inch square channel with a sluice gate at the inlet. The inlet channel is at the bottom of the reservoir and was not inspected. According to Bob Santoro, the sluice gate is not operational.	Repairs of the sluice gate should be commenced to allow the reservoir to be drained in an emergency situation.
INTAKE STRUCTURE	Same as above.	Same as above.
OUTLET STRUCTURE	The outlet structure is not visible due to the roadway fill placed on top of the dam.	A conduit should be placed through the fill connecting the drain pipe to the downstream channel.
OUTLET CHANNEL	Same as above.	Same as above.
EMERGENCY GATE	None.	None.

INSTRUMENTATION

VISUAL EXAMINATION	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
MONUMENTATION/SURVEYS	None noted.	None.
OBSERVATION WELLS	N/A	None.
WEIRS	None noted.	None.
PIEZOMETERS	N/A	None.
OTHER	N/A	None.

DOWNSTREAM CHANNEL

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONDITION (OBSTRUCTIONS, DEBRIS, ETC.)	There is a considerable amount of debris in the downstream channel. There is an old abandoned road running parallel about 100' downstream. This road has two culverts underneath which the channel flows through.	Clear debris away and remove road and culverts.
SLOPES	The slopes adjacent to the downstream channel are mild and have the characteristics of a marsh.	None
APPROXIMATE NO. OF HOMES AND POPULATION	The town of Stony Point is about 6 miles downstream. These houses do not appear to be in danger of water impounded by Lake Tiorati.	None

RESERVOIR

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SLOPES	Slopes are steep and well vegetated with trees.	None
SEDIMENTATION	No problems noted.	None

ITEM	REMARKS
MONITORING SYSTEMS	None noted.
MODIFICATIONS	A 12 inch concrete layer was placed over a portion of the upstream face.
HIGH POOL RECORDS	None noted.
POST CONSTRUCTION ENGINEERING STUDIES AND REPORTS	July 7, 1973
PRIOR ACCIDENTS OR FAILURE OF DAM DESCRIPTION REPORTS	None noted.
MAINTENANCE OPERATION RECORDS	None noted.

ITEM	REMARKS
DESIGN REPORTS	None Noted.
GEOLOGY REPORTS	None noted.
DESIGN COMPUTATIONS	None noted.
HYDROLOGY & HYDRAULICS	See Section A-16.
DAM STABILITY	See Section A-17.
SEEPAGE STUDIES	None noted.
MATERIALS INVESTIGATIONS	None noted.
BORING RECORDS	None noted.
LABORATORY	None noted.
FIELD	None noted.
POST-CONSTRUCTION SURVEYS OF DAM	
BORROW SOURCES.	N/A

CHECK LIST
ENGINEERING DATA
DESIGN, CONSTRUCTION, OPERATION

ITEM	REMARKS
PLAN OF DAM	See Figures 4 & 5.
REGIONAL VICINITY MAP	See Figure 1.
CONSTRUCTION HISTORY	None.
TYPICAL SECTIONS OF DAM	See Figures 4 & 5.
HYDROLOGIC/HYDRAULIC DATA	See
OUTLETS - PLAN	See Figure 4
- DETAILS	See Figure 4
-CONSTRAINTS -DISCHARGE RATINGS	Sluice gate not operational Spillway - 234 CFS, drain - OEFS.
RAINFALL/RESERVOIR RECORDS	None noted.

ITEM	REMARKS
SPILLWAY PLAN	
SECTIONS	See Figure 4.
DETAILS	
OPERATING EQUIPMENT PLANS & DETAILS	See Figure 4.

CHECK LIST
HYDROLOGIC AND HYDRAULIC DATA
ENGINEERING DATA

DRAINAGE AREA CHARACTERISTICS: 1.28 sq. mi. - steep slopes

ELEVATION TOP NORMAL POOL (STORAGE CAPACITY): 1030 feet MSL

ELEVATION TOP FLOOD CONTROL POOL (STORAGE CAPACITY): 1031.6 feet MSL

ELEVATION MAXIMUM DESIGN POOL: 1031 feet MSL

ELEVATION TOP DAM: 1033 feet MSL

CREST:

a. Elevation 1033 feet MSL
b. Type Concrete
c. Width 3 feet
d. Length 518 feet
e. Location Spillover 80 & 110 feet from left abutment
f. Number and Type of Gates None

OUTLET WORKS: Not operational

a. Type sluice gates
b. Location 140 feet from left abutment
c. Entrance inverts
d. Exit inverts
e. Emergency drawdown facilities not operational

HYDROMETEOROLOGICAL GAGES: None
a. Type None
b. Location None
c. Records None

MAXIMUM NON-DAMAGING DISCHARGE: 234 CFS

HYDROLOGIC AND HYDRAULIC CALCULATIONS

JUSTIN & COURTNEY, INC.
Division of O'Brien & Gere Engineers, Inc.
PHILADELPHIA, PA

SHEET NO. ____ OF ____

NAME OF CLIENT NYSDEC

DATE 8/29/78

PROJECT Lake Taghkanic

COMP. BY DBC

CHECKED BY ____

Hydrology (Significant hazard - intermediate size)

Spillway Design Flood - ½ PMF

Drainage Basin = 1.26 sq. mi.

Reservoir Surface Area = .45 sq. mi.

$\therefore$ Reservoir = $\frac{.45}{1.26} \times 100 \approx 36\%$

6 HR - 10 SQ MILE PMP = 24"

Assume

1) Initial reservoir pool at spillway crest,
2) no out flow, and
3) instantaneous concentration of the 6 hour - "½ PMP" on the reservoir.

$24"/2 \times \frac{1.26}{.45} = 33.6" \simeq 2.8'$

Since the reservoir is provided with 3 feet of freeboard above the spillway crest, the spillway is hydraulically adequate for floods in excess of the Spillway Design Flood.

PREVIOUS INSPECTION REPORTS

DEC DAM INSPECTION REPORT LAKE TIORATI

RB	CTY	YR. AP.	DAM NO.	INS. DATE	USE	TYPE
01	36	24	00374	07073	002	2

AS BUILT INSPECTION

1 Location of Spillway and outlet	1 Elevations
1 Size of Spillway and outlet	1 Geometry of Non-overflow section

2 GENERAL CONDITION OF NON-OVERFLOW SECTION

1 Settlement	2 Cracks	1 Deflections
1 Joints	2 Surface of Concrete	3 Leakage
3 Undermining	2 Settlement of Embankment	2 Crest of Dam
3 Downstream Slope Trees	2 Upstream Slope Trees	3 Toe of Slope

1 GENERAL CONDITION OF SPILLWAY AND OUTLET WORKS

4 Auxiliary Spillway	2 Service or Concrete Spillway	4 Stilling Basin
2 Joints	2 Surface of Concrete	2 Spillway Toe
2 Mechanical Equipment	2 Plunge Pool	4 Drain

1 Maintenance	B Hazard Class
1 Evaluation	5 Inspector

COMMENTS: Rock trash inspected 6/77 still leaking - To repair.

STABILITY ANALYSES

JUSTIN & COURTNEY, INC.
Division of O'Brien & Gere Engineers, Inc.
PHILADELPHIA, PA

SHEET NO. _____ OF _____

DATE 8/30/78

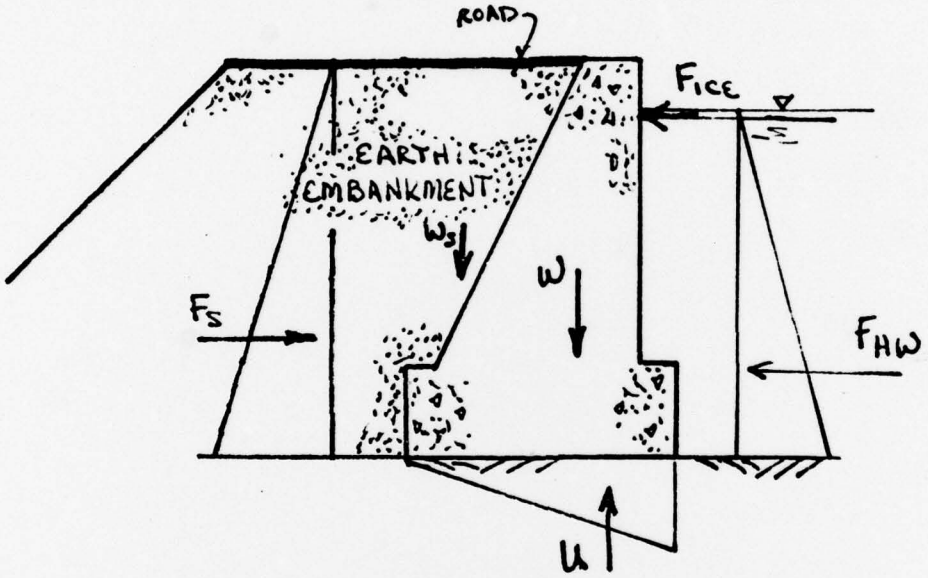
NAME OF CLIENT NYSDEC

COMP. BY DBC

PROJECT Lake Tiorati Dams

CHECKED BY _____

STABILITY ANALYSES



W - Weight of dam

F_{HW} - Headwater Force

U - Uplift

F_S - Active Pressure of Soil against the dam

W_S - Weight of Soil acting on the dam

F_{ICE} - Ice load

JUSTIN & COURTNEY, INC.
Division of O'Brien & Gere Engineers, Inc.
PHILADELPHIA, PA

SHEET NO. ____ OF ____

NAME OF CLIENT NYSDEC

DATE 8/30/78

PROJECT Lake Tiorati Dam

COMP. BY DBC

CHECKED BY ____

PASSIVE SOIL FORCE

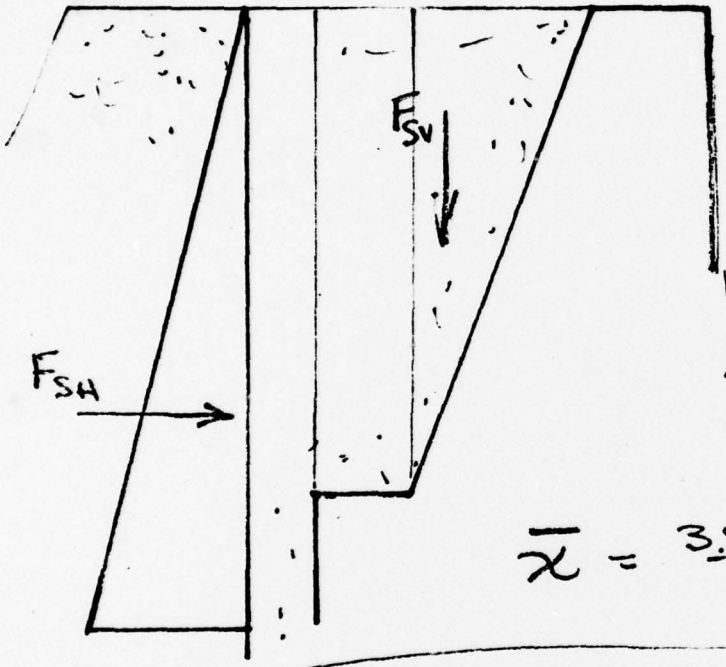
$\gamma_{sat} = 130 pcf$

$K_a = .33$

$F_s = \frac{1}{2} K_a \gamma_{sat} h^2$

$F_{SH} = 10.4^K \quad \bar{y} = 7.33'$

← HORIZONT



WEIGHT OF SOIL

$1.8' \times 16.5' \times 130 pcf = 3.9^K @ .9'$

$\frac{1}{2} \times 8' \times 16.5' \times 130 pcf = 8.6^K @ 4.5$

$$\bar{x} = \frac{3.9 \times .9 + 8.6 \times 4.5}{3.9 + 8.6} = 3.38$$

$F_{SV} = 12.5^K @ \bar{x} = 3.38'$

← VERTICAL

EVALUATION OF LOADINGS DUE TO DOWNSTREAM EMBANKMENT

****

LAKE TIORATI DAM STABILITY ANALYSIS
NORMAL POOL

****

BASE ELEVATION= 1011.00FT. TOP ELEVATION= 1033.00FT. BASE WIDTH= 14.60FT. DENSITY= 145.00PCF
HEADWATER ELEVATION= 1030.00FT. TAILWATER ELEVATION= .00FT. EARTHQUAKE ACCELERATION###.000G (HORIZ),.000G (VERT)
SILT ELEVATION= .00FT. SILT DENSITY(SUBMERGED)= .00PCF SILT PRESSURE COEFFICIENT(K)= .33
SHEAR STRESS= 50.00PSI SHEAR WIDTH= 13.60FT. FRICTION FACTOR= .60

****

LOADING	FORCE(KIPS)	ARM(FEET)	STABILIZING MOMENT	OVERTURNING MOMENT
WEIGHT OF DAM	27.59	8.09	223.12	
HEADWATER	11.26	6.33		71.26
UPLIFT	8.65	9.73		84.24
D/S SOIL (HORIZ)	10.40	7.33	76.23	
D/S SOIL (VERT)	12.50	3.38	42.25	
			*********	*********
			341.61	155.50

****

NET HORIZONTAL FORCE= .86 KIPS
NET VERTICAL FORCE= 31.44 KIPS
NET MOMENT= 186.10KIP-FEET
X-BAR OF FOUNDATION REACTION= 5.92 FEET
ECCENTRICITY OF FOUNDATION REACTION FROM CENTER= 1.38 FEET
FOUNDATION REACTION PRESSURES********TOE= 23.44 PSI********HEEL= 6.47 PSI********
OVERTURNING FACTOR OF SAFETY= 2.20
SLIDING FACTOR OF SAFETY= 21.85
DEVELOPED FRICTION FACTOR (NO SHEAR)= .03
SLIDING WITH KEYWAY SHEAR-FACTOR OF SAFETY=135.29(SHEAR ACROSS KEYWAY ONLY)

LAKE TIORATI DAM STABILITY ANALYSIS
POOL AT TOP OF DAM

BASE ELEVATION= 1011.00FT. TOP ELEVATION= 1033.00FT. BASE WIDTH= 14.60FT. DENSITY= 145.00PCF
HEADWATER ELEVATION= 1033.00FT. TAILWATER ELEVATION= .00FT. EARTHQUAKE ACCELERATION***.000G (HORIZ),.000G (VERT)
SILT ELEVATION= .00FT. SILT DENSITY(SUBMERGED)= .00PCF SILT PRESSURE COEFFICIENT(K)= .33
SHEAR STRESS= 50.00PSI SHEAR WIDTH= 13.60FT. FRICTION FACTOR= .60

LOADING	FORCE(KIPS)	ARM(FEET)	STABILIZING MOMENT	OVERTURNING MOMENT
WEIGHT OF DAM	27.59	8.09	223.12	
HEADWATER	15.10	7.33		110.63
UPLIFT	10.02	9.73		97.54
D/S SOIL (HORIZ)	10.40	7.33	76.23	
D/S SOIL (VERT)	12.50	3.38	42.25	
			*********	*********
			341.61	208.17

NET HORIZONTAL FORCE= 4.70 KIPS
NET VERTICAL FORCE= 30.07 KIPS
NET MOMENT= 133.44KIP-FEET
X-BAR OF FOUNDATION REACTION= 4.44 FEET
ECCENTRICITY OF FOUNDATION REACTION FROM CENTER= 2.86 FEET
**********FOUNDATION REACTION NOT IN CENTRAL THIRD OF BASE*****TENSION AT HEEL OF DAM******
FOUNDATION REACTION PRESSURES********TOE= 31.13 PSI********HEEL= -2.52 PSI********
OVERTURNING FACTOR OF SAFETY= 1.64
SLIDING FACTOR OF SAFETY= 3.84
DEVELOPED FRICTION FACTOR (NO SHEAR)= .16
SLIDING WITH KEYWAY SHEAR-FACTOR OF SAFETY= 24.67(SHEAR ACROSS KEYWAY ONLY)

****

LAKE TIORATI DAM STABILITY ANALYSIS

NORMAL POOL AND ICE LOAD

****

BASE ELEVATION= 1011.00FT. TOP ELEVATION= 1033.00FT. BASE WIDTH= 14.60FT. DENSITY= 145.00PCF

HEADWATER ELEVATION= 1030.00FT. TAILWATER ELEVATION= .00FT. EARTHQUAKE ACCELERATION***.000G (HORIZ),.000G (VERT)

SILT ELEVATION= .00FT. SILT DENSITY(SUBMERGED)= .00PCF SILT PRESSURE COEFFICIENT(K)= .33

SHEAR STRESS= 50.00PSI SHEAR WIDTH= 13.60FT. FRICTION FACTOR= .60

LOADING	FORCE(KIPS)	ARM(FEET)	STABILIZING MOMENT	OVERTURNING MOMENT
WEIGHT OF DAM	27.59	8.09	223.12	
HEADWATER	11.26	6.33		71.26
UPLIFT	8.65	9.73		84.24
D/S SOIL (HORIZ)	10.40	7.33	76.23	
D/S SOIL (VERT)	12.50	3.38	42.25	
ICE LOAD	5.00	18.00		90.00
			*********	*********
			341.61	245.50

****

NET HORIZONTAL FORCE= -6.64 KIPS

NET VERTICAL FORCE= 18.94 KIPS

NET MOMENT= 96.10KIP-FEET

X-BAR OF FOUNDATION REACTION= 5.07 FEET

ECCENTRICITY OF FOUNDATION REACTION FROM CENTER= 2.23 FEET

FOUNDATION REACTION PRESSURES********TOE= 17.25 PSI*******HEEL= .77 PSI********

OVERTURNING FACTOR OF SAFETY= 1.39

SLIDING FACTOR OF SAFETY= -1.71

DEVELOPED FRICTION FACTOR (NO SHEAR)= -.35

SLIDING WITH KEYWAY SHEAR-FACTOR OF SAFETY=-16.47(SHEAR ACROSS KEYWAY ONLY)

NUMBER OF STATIONS TO DESCRIBE DAM= 6

STATION	ELEVATION
.00	1016.50
1.80	1016.50
9.80	1033.00
12.80	1033.00
12.80	1016.50
13.60	1016.50

STOP 0